



Reg. No. : .....

Name : .....



K20P 0128

IV Semester M.Sc. Degree (CBSS-Reg./Suppl./Imp.) Examination, April 2020  
(2014 Admission Onwards)

PHYSICS

PHY4E11 : Nanoscience and Technology

Time : 3 Hours

Max. Marks : 60

SECTION – A

Answer **both** questions (either **a** or **b**).

1. a) i) Give the theory of X-ray diffraction.  
ii) Explain how will you determine particle size using X-ray diffraction.

OR

- b) What are metal nanoclusters ? Explain the theoretical modeling of nanoparticles.
2. a) Explain the fabrication of carbon nanotubes using chemical vapour deposition technique. Write a note on the (i) electrical and (ii) mechanical properties of carbon nanotubes.

OR

- b) Write short notes on :
  - i) Giant and colossal magnetoresistance
  - ii) Ferrofluids.

(2×12=24)

SECTION – B

Answer **any four** (**One** mark for part **a**, **3** marks for part **b**, **5** marks for part **c**).

3. a) What is Moore's law ?  
b) Explain Rayleigh's criteria of resolving power of a microscope.  
c) Describe Focused Ion Beam Spectrometry (FIB).

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4. a) Give two important properties of nanoparticles.  
b) What are magnetic nanoclusters ?  
c) Write a note on super fluid clusters.
5. a) What is optical extinction ?  
b) Write a note on the nature of carbon bond.  
c) Write a note on :  
i) Structure and  
ii) Superconductivity in  $C_{60}$  molecule.
6. a) Distinguish between fluorescence and phosphorescence.  
b) What are photonic crystals ? Plot energy versus wave vector for an one dimensional lattice.  
c) Describe chill block melt spinning with illustration of apparatus.
7. a) Name the two methods of preparation of quantum nanostructures.  
b) What are excitons ?  
c) Discuss Coulomb blockade in superconductors.
8. a) What are ferromagnetic domains ?  
b) Distinguish between ferromagnetic, ferrimagnetic and antiferromagnetic materials.  
c) Explain nanopore containment of nanoparticles. **(4×9=36)**